Frame-based analysis of polysemous words in Japanese FrameNet

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Outline

1. Purpose of the talk
2. What is Japanese FrameNet
3. How is Frame-based Japanese FrameNet different from other linguistic resources
4. Summary
Purpose of the talk

• Preliminary report on an on-going study

- Comparing lexical entries of Japanese FrameNet (JFN) with those in other linguistic resources

- To Test the hypothesis “Frame-based analysis is suited for describing related word senses”
What is Japanese FrameNet
Japanese FrameNet (JFN)

• Creating a **prototype of an on-line Japanese linguistic resource** following FrameNet methodology and practice

• Compatibility with FrameNet
  – JFN databases and annotation tool
  – JFN frames: imported from FN (the Expand approach)
  – Annotation methods

• Lexicon building > Full Text Annotation > Constructicon Building
JFN Annotation Tool

Lexical Unit

Postposition Layer
Valence Patterns in JFN

Consist of:

• Frame Elements (FEs)

• Grammatical Functions (GFs: Subj, Obj, ...)

• Phrase Types (PTs)

• Postpositions (i.e., “surface” case)
### JFN Output: Lexical Entry Report

#### Valence Patterns:

These frame elements occur in the following syntactic patterns:

<table>
<thead>
<tr>
<th>Number Annotated</th>
<th>Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deictic</td>
</tr>
<tr>
<td>1</td>
<td>AVP</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>TOTAL</td>
</tr>
<tr>
<td></td>
<td>AVP</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>

#### Postposition Layer

- そして 彼は あごひげなどで 変装して、モーティマー 医師をここまで 遠行して みたが、マリーの 部屋 に登り 時間を取ったとき に「車 がけが した」という 連絡が 客に きずが けが した か といった 表情が 数件寄せられた という。
- 美智子が タクシー に飛び乗ら れた が、なかなか 違合 がないから 彼 は 覚悟を 決めた。
- 結果の 郵便 が 遅く たら、相手に 自動 连絡 する 連絡が 新手の サービスだろう。
- 信号が 障害 から、骨壺（つぼ） を送って 連絡が はかどる まで 通常 1 時間半 と見込まれて
Experiencer_focus

Definition:

The words in this frame describe an experienter's emotions with respect to some content. A explanation for the emotion in current state of affairs, quite often it refers to a general situation which causes the emotion.

- **Joy** of the movie was considerably impaired by the seven-foot guy sitting in front of me. [Yahoo!Japan]

- **Smithers takes great pleasure** in collecting matchboxes. [Yahoo!Japan]
Current Status

• Lexicographic annotation
  • # of LU’s: 3,000 -
  • # of Annotated Sentences: 60,000 -
• Full Text Annotation
  • # of Annotated Sentences: 1,000 -

• Constructicon Building
• JFN Web Annotation Tool (JFNWAT)
JFN Web Annotation Tool (JFNWAT)

Being developed by Interns from Ecole Centrale de Lyon
Current Grants

• Constructicon Building
  – Grant-in-Aid for Scientific Research
    • 2012-2015

• Full Text Annotation
  – Grant from the National Institute of Japanese Language and Linguistics
    • 2012-

• JFN Data Release
  – Grant-in-Aid for Scientific Research
    • 2013-2017
How is Frame-based Japanese FrameNet different from other linguistic resources
“Predicate frame lexicons” in Japanese

- IPAL (Information-Technology Promotion Agency, 1987)
- EDA (Japan Electronic Dictionary Research Institute, 1995)
- GoiTaikei (Ikehara et al., 1997)
- Japanese FrameNet (Ohara et al., 2003)
- Kyoto University Case Frames (Kawahara & Kurohashi, 2006)
- Verb Argument Structure Thesaurus (VAST) (Takeuchi et al., 2010)
Comparing VAST & JFN entries

• VAST
  • “splitter” approach rather than “lumper” approach, just like JFN?!

• Method
  • Collected 109 lemmas in JFN having multiple LU’s
  • Compared VAST & JFN entries

• Hypothesis
  • Frame-based approach of Berkeley FrameNet and Japanese FrameNet (inter alia) is better suited to describing related word senses, due to
    • Fine-grained Frame Elements, relativized to frames
    • Rich Valency annotations
Case Study 1
VAST entries for *omou* ‘think, ponder’

(1) Takeuchi et al. 2010

a. <Experiencer> ga <Target> o <Descriptive> *omou*
   NOM ACC think

b. <Agent> ga <Target> o *omou*
   NOM ACC imagine

c. <Agent> ga <Target> o *omou*
   NOM ACC ponder
JFN frames for omou.v

(2) Cogitation frame
   A Cognizer, thinks about a Topic over a period of time.

(3) Coming_to_believe frame
   A Cognizer, comes to believe something (the Content), sometimes after a process of reasoning.

(4) Deciding frame
   A Cognizer makes a Decision, which may be about an entity or a course of action.

(5) Expectation frame
   A Cognizer, believes that some Phenomenon will take place in the future.

(6) Opinion frame
   A Cognizer holds a particular Opinion, which may be portrayed as being about a particular Topic.
Matching VAST and JFN entries for *omou*

a. `<Experiencer> ga <Target> o <Descriptive> omou`
   NOM ACC think
   ⇒ Opinion frame

b. `<Agent> ga <Target> o omou`
   NOM ACC imagine
   ⇒ Cogitation frame

c. `<Agent> ga <Target> o omou`
   NOM ACC ponder
   ⇒ Cogitation frame
Comparing VAST and JFN entries for *omou*

- Among the 5 LU’s for *omou.v* in JFN, *Cogitation.* *omou.v* is the only LU with postpositions *ga (NOM) + o (ACC)* alone. The other uses take the quotative marker *to*.

- *watasi -tati ga  aisuru hito-tati no  koto o omou toki ...*  
  1st person PL. NOM love person Pl. GEN thing ACC when  
  “When we think about the people whom we love, ...”

VAST does not reflect the fact above
Case Study 2
VAST and JFN entries for *kangaeru* ‘think’

(7) Entry for *kangaeru.v* ‘think’ in VAST

<Experiencer> *ga* <Content> *o kangaeru*

NOM ACC

e.g. [<Content> *kono syoosetu no teema o*] *kangaeru*

this novel GEN theme ACC

‘(I) think about the theme of this novel.’

(8) Cogitation frame in JFN

A **Cognizer** thinks about a **Topic** over a period of time.

(9) Cogitation. *kangaeru.v* in JFN

[**Cognizer** External NP *ga*] [**Topic** Dependent NP/S *o ni.tuite’ kangaeru*]

NOM ACC/about
JFN annotation for *kangaeru*.v

(10) *Zen.sekai ni.watatte [**TOPIC** kono mondai [ni.tuite] kangaeru* all.world throughout this problem about

*beki da*

should COP

‘Throughout the whole world, (we) should consider this problem.’

(11) *[**TOPIC** dare ga daihyoo to.site husawasii ka] kangaeru*

who NOM representative as appropriate Q

‘think who would be appropriate as the representative’

⇒ JFN records the fact that *Cogitation.kangaeru*.v allows the **TOPIC** to accompany the postposition [ni.tuite] and to be realized as a **sentential complement** (PT=S), but *not* VAST.
Case study 3
Describing relations between senses

– hanako wa **taroo ni** tyokoreeto o **ageta**

    TOP    DAT chocolate    ACC gave

‘Hanako gave chocolate to Taro.’

– hanako wa **taroo ni** tyokoreeto o **moratta**

    TOP    DAT    ACC received

‘Hanako received chocolate from Taro.’
JFN entries for *ageru* ‘give’ & *morau* ‘receive’

– Giving frame

• A **Donor** transfers a **Theme** from a **Donor** to a **Recipient**.

• *hanako wa* [taroo ni] *tyokoreeto o* *ageta*

  TOP   DAT chocolate   ACC gave

  ‘Hanako gave chocolate to Taro.’

– Receiving frame

• A **Recipient** comes into possession of the **Theme** as a result of the joint action of the **Donor** and the **Recipient**.

• *hanako wa* [taroo ni] *tyokoreeto o* *moratta*

  TOP   DAT   ACC received

  ‘Hanako received chocolate from Taro.’
JFN valence patterns for *ageru* ‘give’ & *morau* ‘receive’

- **Giving frame**
  - *ageru.v*
    ```
    { [Donor .EXT.NP.ga ]
    [Recipient .Dep.NP.ni] 
    [Theme .Obj.NP.o]}
    ```

- **Receiving frame**
  - *morau.v*
    ```
    {[Recipient .EXT.NP.ga ]
    [Donor .Dep.NP.ni] 
    [Theme .Obj.NP.o]}
    ```
Frame-to-Frame relations between Giving & Receiving frames

⇒ VAST cannot describe relations between senses
Summary

• Frame-based approach, i.e., rich valency annotation, especially information about \textit{PT and Postposition (i.e., “surface” case)}, is better suited for describing fine-grained senses of polysemous words.

• Frame-to-Frame relations help to describe relations between senses.

• Future directions
  – Compare annotations (cf. de Melo et al. 2012)
  – Use JFN in applications such as Word Sense Disambiguation, Paraphrasing, and Machine Translation (cf. Hasegawa et al. 2011, 2012)
Thank You!

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  - Grant from the National Institute of Japanese Language and Linguistics
Selected References

URLs


- JFN data on FrameSQL
  [http://framenet2.icsi.berkeley.edu/frameSQL/jfn23/notes/index.html](http://framenet2.icsi.berkeley.edu/frameSQL/jfn23/notes/index.html)

- Japanese FrameNet on YouTube
  [http://www.youtube.com/watch?v=kfqR9aUcp1c](http://www.youtube.com/watch?v=kfqR9aUcp1c)